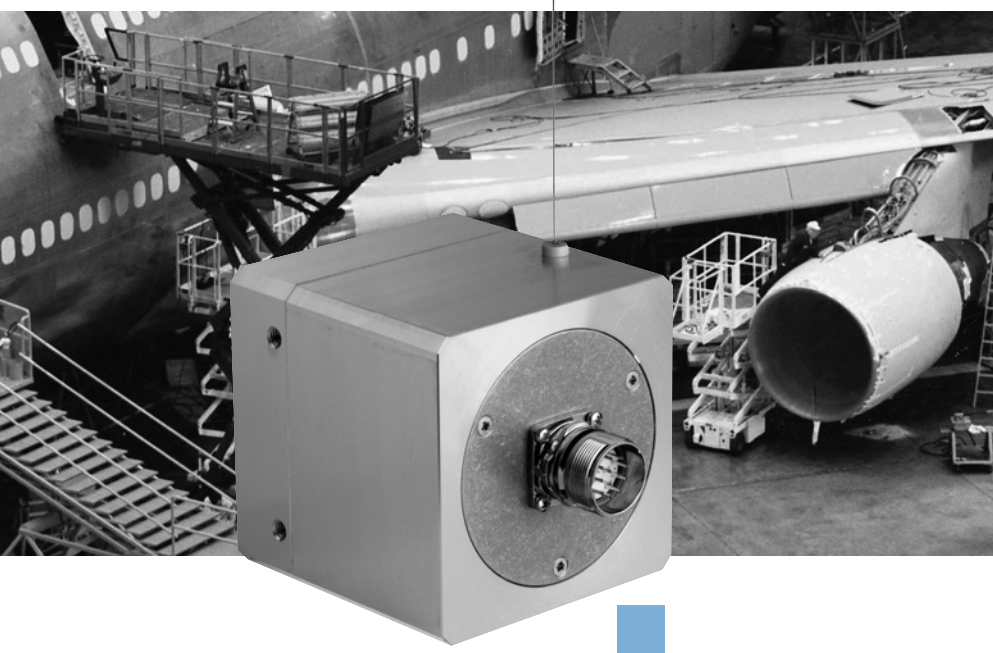


BKS/XKS/PKS: Compact absolute and incremental wire draw encoders for measuring lengths up to 5 m



Precise linear guidance, as required for other length measurement systems, is not necessary.

The choice between absolute and incremental wire draw encoders manufactured by SICK-STEMMANN enables made-to-measure solutions for many application profiles.

- SSI and HIPERFACE interfaces for absolute wire draw encoders and Profibus interface via the HIPERFACE Profibus Adapter

- TTL interface for incremental wire draw encoders are common interfaces in automation technology and meet its exacting requirements.

In these compact wire draw encoders, the encoder is integrated into the wire draw mechanism to minimise the size of the unit .

The number of drum rotations, which is proportional to the length, is counted by an encoder and converted to a measuring signal. This provides high-resolution position or distance information for linear measurement paths, even under difficult mounting conditions.

The measuring lengths of 2 m and 5 m cover most of the possible applications, for example in:

Presses, punching and injection machines, storage technology, wood and sheet metal processing machines, machinery construction, medical technology and many other industries.

	Resolution 0.05 mm
Absolute wire draw encoder	

	128 sine-/ cosine periods
Motor Feedback wire draw encoder	

	Resolution 0.05 mm
Incremental wire draw encoder	

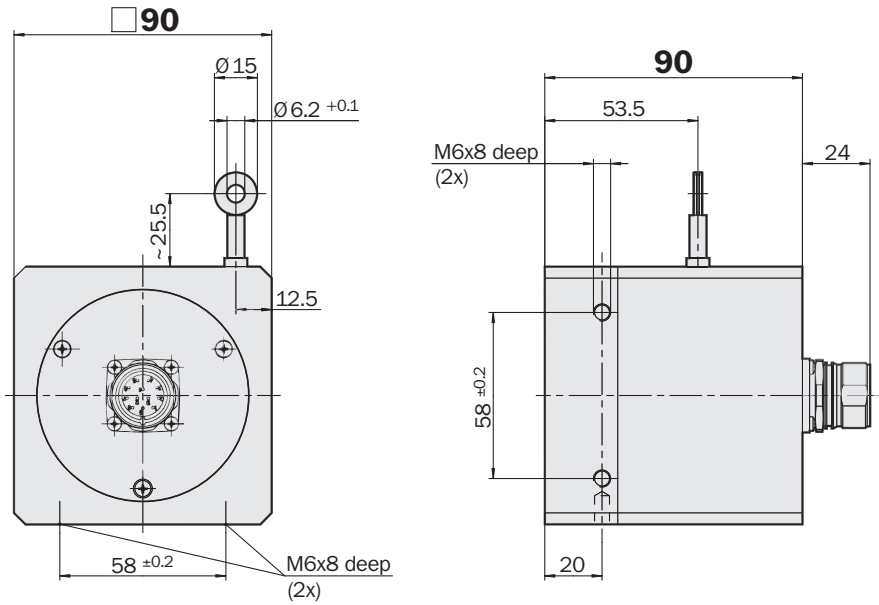
Resolution
0.05 mm

Absolute wire draw encoder

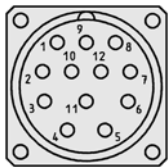
- Extremely compact construction
- High resolution
- Easy to mount
- High-precision measurement drum
- Stable spring return
- Highly flexible steel wire
- Robust aluminium housing



Dimensional drawing of absolute wire draw encoder BKS09 SSI, measuring lengths 2 m and 5 m



General tolerances to DIN ISO 2768-mk



View of the M23 connector on the encoder

- Accessories**
- Connection systems
 - Adapter modules

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	N. C.	grey	Not connected
5	N. C.	green	Not connected
6	N. C.	pink	Not connected
7	N. C.	black	Not connected
8	U _s	red	Operating voltage
9	N. C.	orange	Not connected
10	Data -	brown	Interface signals
11	Clock -	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected!

Technical Data		BKS09 SSI	2 m	5 m							
Housing	Aluminium										
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.6 mm (PA 12 sheathed)										
Measuring length	2 m max.										
	5 m max.										
Mass	1.5 kg approx.										
Type of code	24 Bit/Gray										
Path of code	Rising at wire pull-out										
Measuring step	0.05 mm										
Linearity	≤ ± 0.7 mm										
Repeatability	± 3 measuring steps										
Operating speed	3.5 m/sec. max.										
Wire acceleration	20 m/s ² max.										
Position forming time	0.1 ms										
Spring return force (typ.)											
Start/finish ¹⁾	5 N/6 N										
Start/finish ¹⁾	4 N/6 N										
Working temperature range	- 10 ... + 70 °C										
Storage temperature range	- 20 ... + 80 °C										
Permitted relative humidity ²⁾	90 %										
Life of wire draw mechanism ³⁾	800,000 cycles										
EMC ⁴⁾											
Resistance											
to shocks ⁵⁾	20/6 g/ms										
to vibration ⁶⁾	10 g (10 ... 2,000 Hz)										
Protection to IEC 60529 ⁷⁾	IP 52										
Operating voltage range (U_s)	12 ... 30 V										
Power consumption (no load)	1.5 W										
Initialisation time ⁸⁾	200 ms										
Interface signals											
Clock +, Clock -, Data +, Data -	SSI max. clock frequency 1.0 MHz or min. LOW level (Clock +): 500 ns										

¹⁾ These values were measured at an ambient temperature of 25°C. There may be variations at other temperatures.

²⁾ Condensation not permitted

³⁾ Average values, which depend on the application.
At high operating speeds over great lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

⁴⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

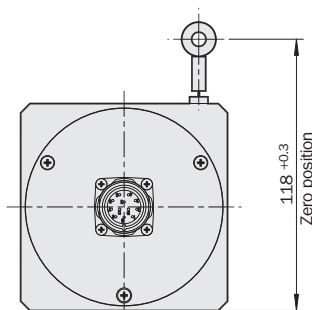
⁵⁾ To DIN EN 60068-2-27

⁶⁾ To DIN EN 60068-2-6

⁷⁾ Note required mounting position

⁸⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

Zero position



Order information

BKS09; U_s 12 ... 30 V; connector M23, 12-pin

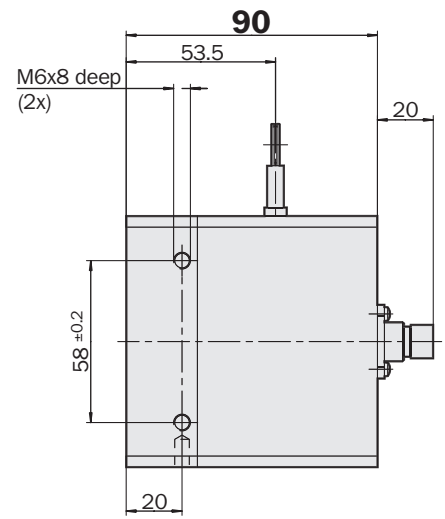
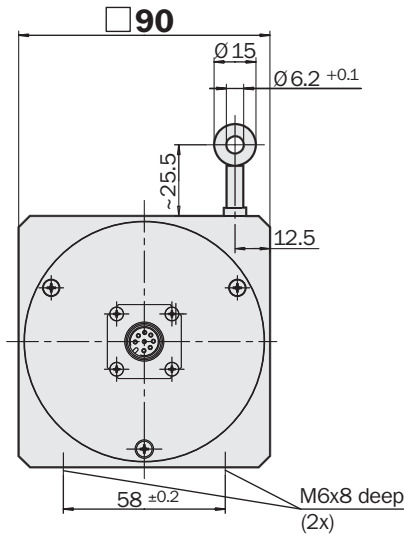
24 Bit SSI, Gray code, Measuring range starts at 0

Type	Part no.	Description
BKS09-ATBM0220	1035240	SSI, measuring length 2 m
BKS09-ATBM0520	1035241	SSI, measuring length 5 m

Dimensional drawing of wire draw encoder XKS09 HIPERFACE, measuring lengths 2 m and 5 m

128 sine-/cosine periods
Motor Feedback wire draw encoder

- Extremely compact construction
- High resolution
- Easy to mount
- High-precision measurement drum
- Stable spring return
- Highly flexible steel wire
- Robust aluminium housing

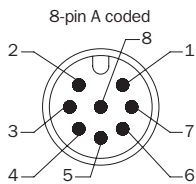
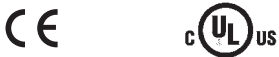


General tolerances to DIN ISO 2768-mk



PIN and wire allocation

PIN	Signal	Wire colours	Explanation
1	REFSIN	brown	Process data channel
2	+ SIN	white	Process data channel
3	REFCOS	black	Process data channel
4	+ COS	pink	Process data channel
5	Data +	yellow	RS 485 Parameter channel
6	Data -	lilac	RS 485 Parameter channel
7	GND	blue	Earth connection
8	+ U _s	red	7 ... 12 V Operating voltage



Accessories
Connection systems
Adapter modules

Technical Data		XKS09 HIPERFACE	2 m	5 m							
Housing	Aluminium										
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.6 mm (PA 12 sheathed)										
Measuring length	2 m max.										
	5 m max.										
Mass	1.5 kg approx.										
Type code for the absolute value	Binary										
Path of code	Rising at wire pull-out										
Length of period	1.1953 mm										
Measuring step after generating arctan with 12 bit resolution	0.295 µm (4096x128) steps/153 mm length										
Linearity	≤ ± 0.7 mm										
Non linearity within sine/cosine period	± 0.01 mm										
Repeatability	± 0.15 mm										
Operating speed	3.5 m/sec. max.										
Wire acceleration	20 m/s ² max.										
Output frequency for sine/cosine signals	0 ... 65 kHz										
Spring return force (typ.)											
Start/finish ¹⁾	5 N/6 N										
Start/finish ¹⁾	4 N/6 N										
Working temperature range	- 10 ... + 70 °C										
Storage temperature range	- 20 ... + 80 °C										
Permitted relative humidity ²⁾	90 %										
Life of wire draw mechanism ³⁾	800,000 cycles										
EMC ⁴⁾											
Resistance											
to shocks ⁵⁾	20/6 g/ms										
to vibration ⁶⁾	10 g (10 ... 2,000 Hz)										
Protection to IEC 60529 ⁷⁾	IP 52										
Operating voltage range	7 ... 12 V										
Recommended supply voltage	8 V										
Operating power consumption (no load)	60 mA										
Available memory area within EEPROM 2048	1.792 Byte										
Interface signals											
Process data channel = SIN, REFSIN, COS, REFCOS	Analogue, differential										
Parameter channel = RS 485	Digital										

¹⁾ These values were measured at an ambient temperature of 25°C. There may be variations at other temperatures.

²⁾ Condensation not permitted

³⁾ Average values, which depend on the application.
At high operating speeds over great lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

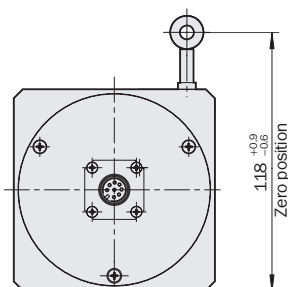
⁴⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3
The EMC according to the standards quoted is achieved when the motor feedback system is mounted in an electrically conductive housing, which is connected to the central earthing point of the motor controller via a cable screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁵⁾ To DIN EN 60068-2-27

⁶⁾ To DIN EN 60068-2-6

⁷⁾ Note required mounting position

Zero position



Order information

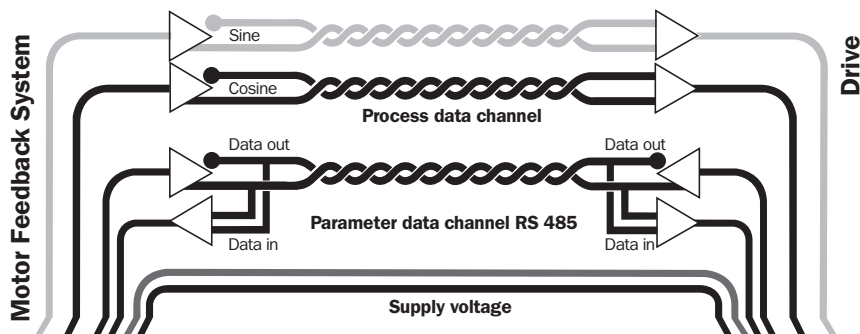
XKS09; U_s 7 ... 12 V; connector M12, 8-pin

Type	Part no.	Description
XKS09-HTBM0227	1035436	HIPERFACE, measuring length 2 m
XKS09-HTBM0527	1035437	HIPERFACE, measuring length 5 m



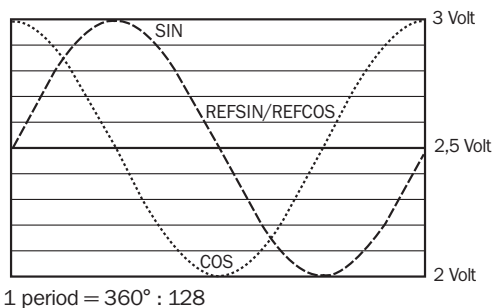
Electrical interface

- Safe data transmission
- High information content
- Electronic type label
- Only 8 leads
- Bus-enabled parameter channel
- Process data channel in real time



Signal specification of the process data channel

Signal diagram for clockwise rotation of the shaft, looking in direction "A"



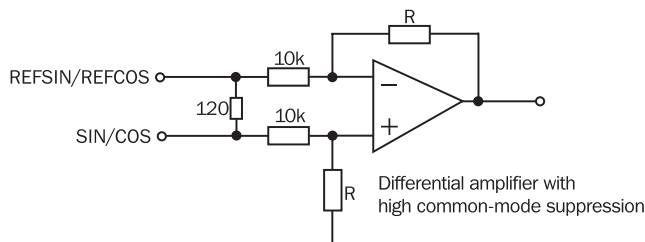
Access to the process data used for speed control, i.e. to the sine and cosine signals, is practically always "online". When the supply voltage is applied, the speed controller has access to this information at any time.

Sophisticated technology guarantees stable amplitudes of the analogue signals across all specified environmental conditions, with a maximum variation of only 30 %.

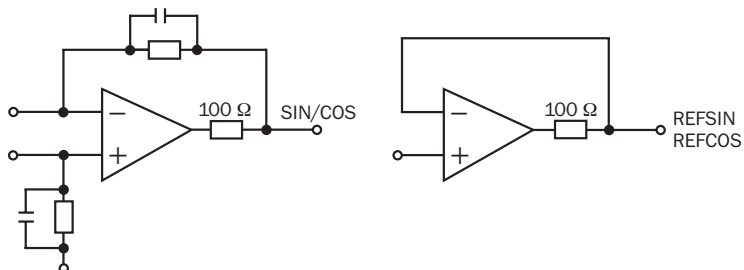
Characteristics applicable to all permissible environmental conditions

Signal	Value/Units
Signal peak, peak V_{SS} of SIN, COS	0.8 ... 1.1 V
Signal offset REFSIN, REFCOS	2.2 ... 2.8 V

Recommended receiver circuit for sine and cosine signals



The output circuit of the process data channel within the SinCos encoder






Type-specific settings	XKS09
Type ID (command 52h)	FFh
Free EEPROM [bytes]	1.792
Address	40h
Mode_485	E4h
Codes 0 ... 3	55h
Counter	0

Overview of commands supported			XKS09
Command byte	Function	Code 0 ¹⁾	Comments
42h	Read position		
43h	Set position	•	
44h	Read analogue value		Channel number 48h Temperature [°C]
46h	Read counter		
47h	Increase counter		
49h	Reset counter	•	
4Ah	Read data		
4Bh	Save data		
4Ch	Determine status of a data field		
4Dh	Create data field		
4Eh	Determine available memory area		
4Fh	Change access code		
50h	Read encoder status		
52h	Read out name plate		Encoder type = FFh
53h	Encoder reset		
55h	Allocate encoder address	•	
56h	Read serial number and program version		
57h	Configure serial interface	•	

¹⁾ The commands thus labelled include the parameter "Code 0". Code 0 is a byte inserted into the protocol, for additional safeguarding of vital system parameters against accidental overwriting. When shipped, "Code 0" = 55h.

Overview of status messages			
Error type	Status code	Description	XKS09
	00h	The encoder has recognised no error	•
Initialisation	01h	Faulty compensating data	•
	02h	Faulty internal angular offset	•
	03h	Data field partitioning table damaged	•
	04h	Analogue limit values not available	•
	05h	Internal I ² C bus not operational	•
	06h	Internal checksum error	•
Protocol	07h	Encoder reset occurred as a result of program monitoring	•
	09h	Parity error	•
	0Ah	Checksum of the data transmitted is incorrect	•
	0Bh	Unknown command code	•
	0Ch	Number of data transmitted is incorrect	•
	0Dh	Command argument transmitted is not allowed	•
Data	0Eh	The selected data field must not be written to	•
	0Fh	Incorrect access code	•
	10h	Size of data field stated cannot be changed	•
	11h	Word address stated, is outside data field	•
	12h	Access to non-existent data field	•
Position	01h	Analogue signals outside specification	
	1Fh	Speed too high, no position formation possible	
	20h	Singleturn position unreliable	•
	21h	Positional error Multiturn	•
	22h	Positional error Multiturn	•
	23h	Positional error Multiturn	•
Other	1Ch	Monitoring the value of the analogue signals (process data)	
	1Dh	LED current critical (dirt, LED breakage)	•
	1Eh	Encoder temperature critical	•
	08h	Counter overflow	•

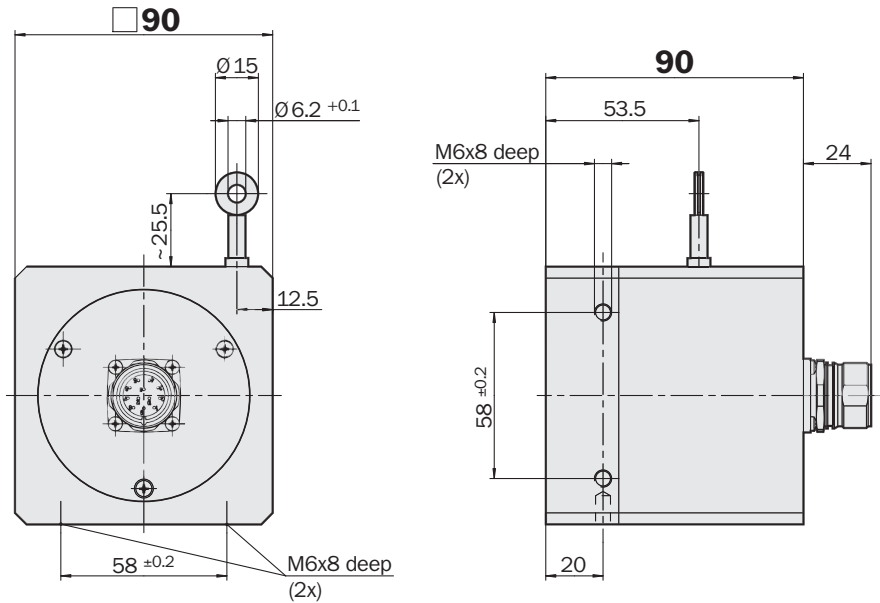
 **Resolution**
0.05 mm

Incremental wire draw encoder

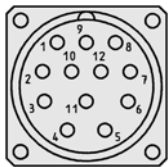
- Extremely compact construction
- High resolution
- Easy to mount
- High-precision measurement drum
- Stable spring return
- Highly flexible steel wire
- Robust aluminium housing



Dimensional drawing of wire draw encoder PKS09 TTL, measuring lengths 2 m and 5 m



General tolerances to DIN ISO 2768-mk



View of the M23 connector on the encoder

Accessories

Connection systems

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	\bar{A}	black	Signal line
2	N. C.	grey	Not connected
3	Z	lilac	Signal line
4	\bar{Z}	yellow	Signal line
5	B	white	Signal line
6	\bar{B}	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	N. C.	green	Not connected
12	U_s	red	Supply voltage ¹⁾

¹⁾ Potential-free to housing

Caution! PINs labelled "N. C." must not be connected!

Technical Data		PKS09 TTL	2 m	5 m						
Housing	Aluminium									
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.6 mm (PA 12 sheathed)									
Measuring length	2 m max.									
	5 m max.									
Mass	1.5 kg approx.									
Electrical interfaces	TTL/RS 422, 6 channels									
Measuring step	0.05 mm ¹									
Reference signal	Number off 1/765 measuring steps									
Linearity	≤ ± 0.7 mm									
Repeatability	± 3 measuring steps									
Operating speed	3.5 m/sec. max.									
Wire acceleration	20 m/s ² max.									
Spring return force (typ.)										
Start/finish ¹⁾	5 N/6 N									
Start/finish ¹⁾	4 N/6 N									
Working temperature range	- 10 ... + 70 °C									
Storage temperature range	- 20 ... + 80 °C									
Permitted relative humidity ²⁾	90 %									
Life of wire draw mechanism ³⁾	800,000 cycles									
EMC ⁴⁾										
Resistance										
to shocks ⁵⁾	20/6 g/ms									
to vibration ⁶⁾	10 g (10 ... 2000 Hz)									
Protection to IEC 60529 ⁷⁾	IP 52									
Operating voltage range (U_s)										
TTL/RS 422, 4,5 ... 5,5 V load current	20 mA max.									
Operating current (no load)										
at 5 V	60 mA typ.									
Initialisierungszeit nach Power on	40 ms									

¹⁾ These values were measured at an ambient temperature of 25°C. There may be variations at other temperatures.

²⁾ Condensation not permitted

³⁾ Average values, which depend on the application.
At high operating speeds over great lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

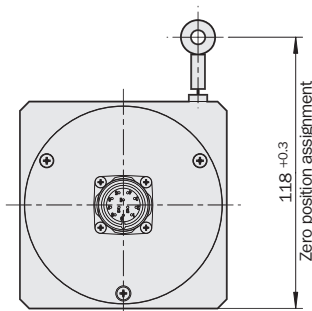
⁴⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁵⁾ To DIN EN 60068-2-27

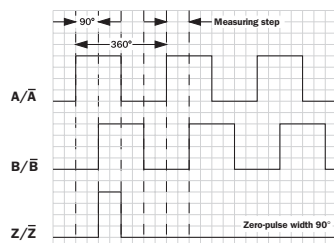
⁶⁾ To DIN EN 60068-2-6

⁷⁾ Note required mounting position

Zero pulse assignment



¹⁾ Based on the control/counter evaluating the edges of the A+B pulses.



Order information

PKS09; connector M23, 12-pin

Type	Part no.	Description
PKS09-ATBM0220	1035242	TTL 4.5 ... 5.5 V; measuring length 2 m
PKS09-ATBM0520	1035243	TTL 4.5 ... 5.5 V; measuring length 5 m

Dimensional drawings and order information

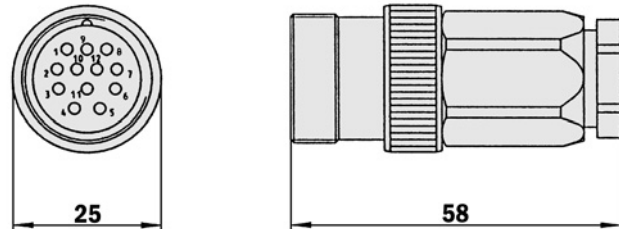
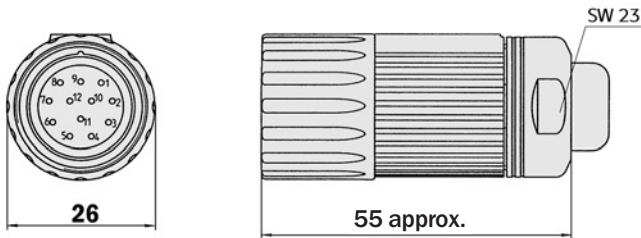
Round screw-in system M23, 12-pin for wire draw encoder BKS with SSI interface

Connector M23 female, 12-pin, straight

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Connector M23 male, 12-pin, straight

Type	Part no.	Contacts
STE-2312-G	6027537	12



Connector M23 female, 12-pin, straight, cable 12-cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² screened, capable of being dragged, cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA1	2029200	12	1.5 m
DOL-2312-G03MMA1	2029201	12	3.0 m
DOL-2312-G05MMA1	2029202	12	5.0 m
DOL-2312-G10MMA1	2029203	12	10.0 m
DOL-2312-G20MMA1	2029204	12	20.0 m
DOL-2312-G30MMA1	2029205	12	30.0 m

Connector M23 female, 12-pin, straight, cable 11-cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Contacts	Cable length
DOL-2312-G02MLA5	2030680	12	2.0 m
DOL-2312-G07MLA5	2030683	12	7.0 m
DOL-2312-G10MLA5	2030686	12	10.0 m
DOL-2312-G15MLA5	2030690	12	15.0 m
DOL-2312-G20MLA5	2030693	12	20.0 m
DOL-2312-G25MLA5	2030697	12	25.0 m
DOL-2312-G30MLA5	2030700	12	30.0 m

Cable, 8-core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11-cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12-cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	Resistant to UV and salt water

Dimensional drawings and order information

Adapter modules for wire draw encoder BKS with SSI interface

Serial Parallel Adapters

Type	Part no.	Description
AD-SSIG-PA	1030106	SSI Parallel Adapter module, in plastic housing
AD-SSI-PA	1030107	SSI Parallel Adapter module, without plastic housing

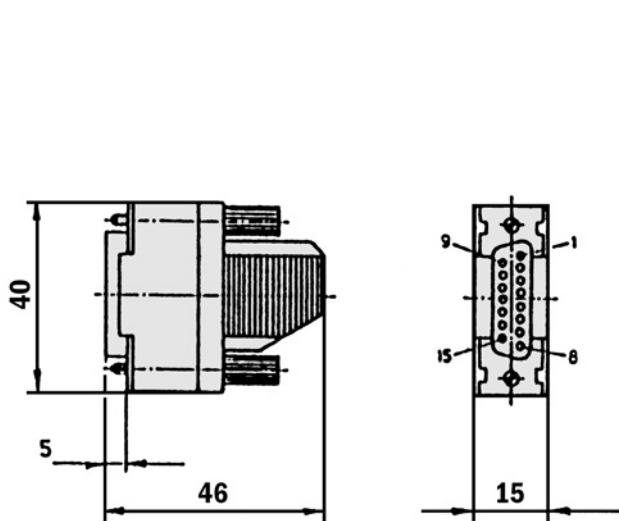
Plug-in system Sub-D connectors for serial parallel adapter

Cable connector Sub-D male, 15 pin, straight, screened

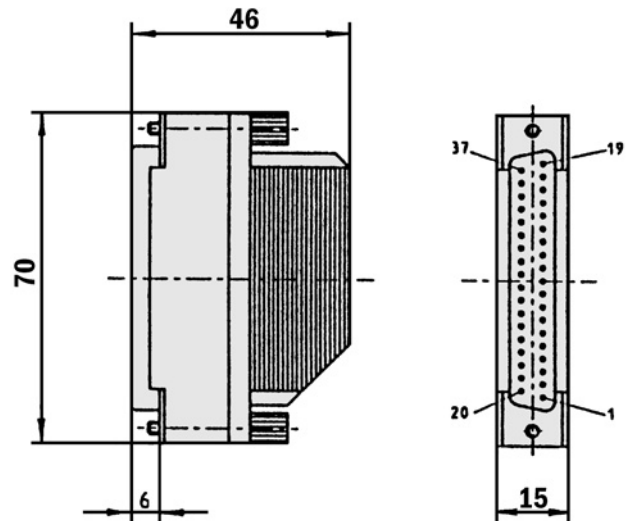
Type	Part no.	Contacts
STE-0D15-G	2029223	15

Cable connector Sub-D female, 37 pin, straight, screened

Type	Part no.	Contacts
DOS-0D37-G	2029224	37



General tolerances to DIN ISO 2768-mk



General tolerances to DIN ISO 2768-mk

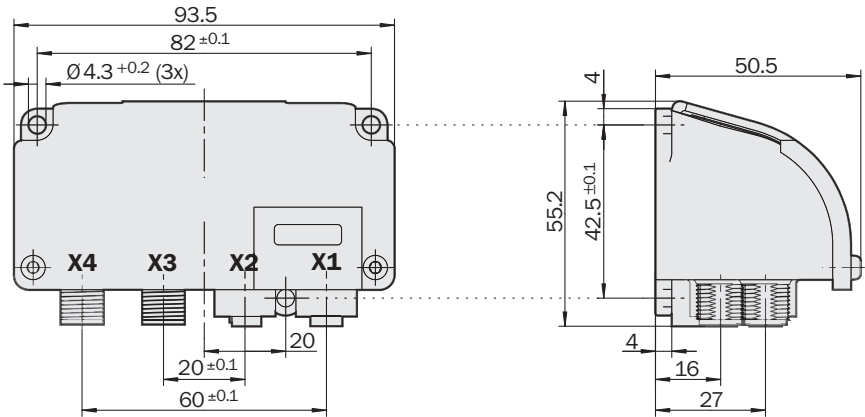
Dimensional drawings and order information

Adapter module for wire draw encoders XKS with HIPERFACE interface

HIPERFACE Profibus Adapter

1

Type	Part no.	Description
AD-HFPRLS4	1035483	HIPERFACE Profibus Adapter



General tolerances to DIN ISO 2768-mk

1 Technical Data and accessories connection systems see data sheet HIPERFACE Profibus Adapter.

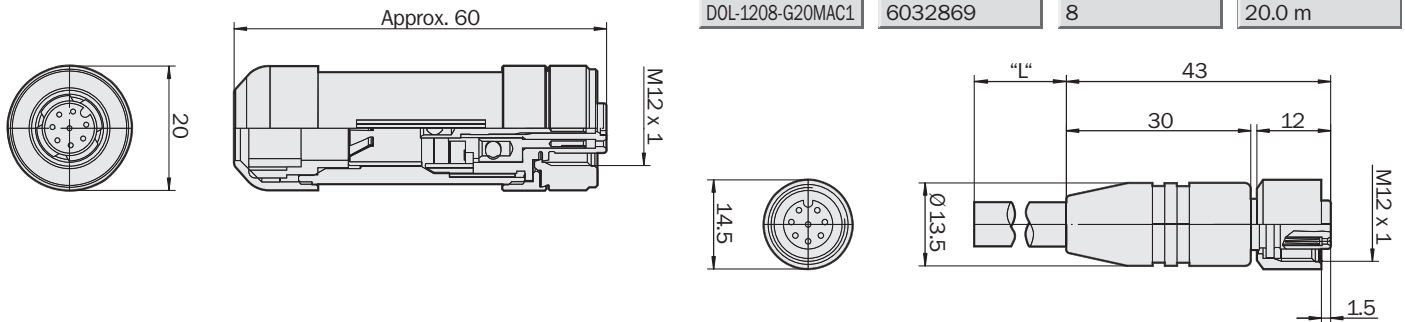
Round screw system M12 for XKS with HIPERFACE interface

Loose female connector M12, 8-pin, straight, screened, for field assembly

Type	Part no.	Contacts/cable diameter
DOS-1208-GA	6028369	8 / 4 ... 8 mm

Female connector M12, 8-pin, straight, pre-wired with cable
8-wire, 4 x 2 x 0.25 mm², screened, flexible

Type	Part no.	Contacts	Cable length
DOL-1208-G02MAC1	6032866	8	2.0 m
DOL-1208-G05MAC1	6032867	8	5.0 m
DOL-1208-G10MAC1	6032868	8	10.0 m
DOL-1208-G20MAC1	6032869	8	20.0 m



Cable 8-wire, per metre, 4 x 2 x 0.25 mm², screened, flexible, cable diameter 7.0 mm

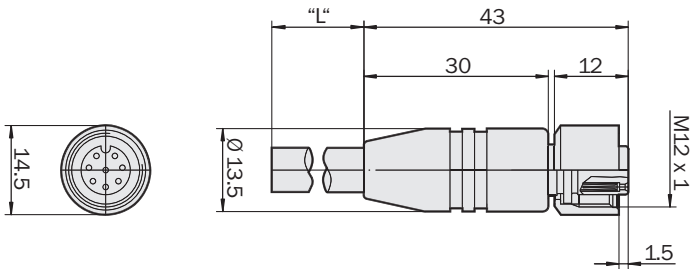
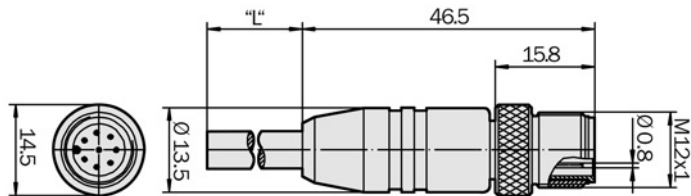
Type	Part no.	Wires
LTG-3208-MW	6032870	8

Dimensional drawings and order information

Round screw system M12 for XKS with HIPERFACE interface

Male connector M12 (HIPERFACE Profibus Adapter) and female connector M12 (wire draw encoder XKS), 8-pin, straight, pre-wired with cable 8-wire, 4 x 2 x 0.25 mm², screened, flexible

Type	Part no.	Contacts	Cable length
DSL-1208-G05MAC1	6032913	8	5.0 m



Dimensional drawings and order information

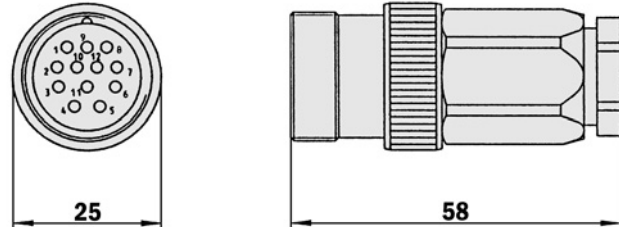
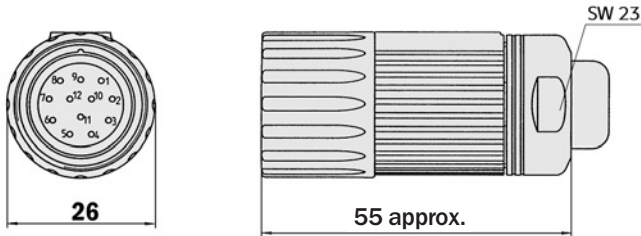
Round screw-in system M23, 12-pin for wire draw encoder PKS with TTL interface

Cable connector M23 female, 12-pin, straight

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Cable connector M23 male, 12-pin, straight

Type	Part no.	Contacts
STE-2312-G	6027537	12



Cable connector M23 female, 12-pin, straight, cable 12 core, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA3	2029212	12	1.5 m
DOL-2312-G03MMA3	2029213	12	3.0 m
DOL-2312-G05MMA3	2029214	12	5.0 m
DOL-2312-G10MMA3	2029215	12	10.0 m
DOL-2312-G20MMA3	2029216	12	20.0 m
DOL-2312-G30MMA3	2029217	12	30.0 m

Connector M23 female, 12-pin, straight, cable 11 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Contacts	Cable length
DOL-2312-G02MLA3	2030682	12	2.0 m
DOL-2312-G07MLA3	2030685	12	7.0 m
DOL-2312-G10MLA3	2030688	12	10.0 m
DOL-2312-G15MLA3	2030692	12	15.0 m
DOL-2312-G20MLA3	2030695	12	20.0 m
DOL-2312-G25MLA3	2030699	12	25.0 m
DOL-2312-G30MLA3	2030702	12	30.0 m

Cable, 8-core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11-core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12-core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	Resistant to UV and salt water



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